

# TRAFFIC AND SAFETY MANUAL

## Chapter 6 – Lighting 6E – Bridge

### Bridge Lighting

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The Office of Bridges and Structures requires lighting hardware and wiring location information so new bridges can be designed to meet lighting needs of the area. After receiving the bridge situation plan, the site should be analyzed and components that are needed for lighting and other utilities are marked up on the plan. Refer to Bridge's Standard Sheet for Lighting Details (1030A) for details of these components. The following guidelines will help in determining what components are needed; however, each site should be examined individually. Some engineering judgment may need to be exercised to determine the best plan for the situation.

#### Conduit



**Figure 1**

Conduit is run through one or both bridge rails so utility cables may be run through the bridge.

The typical bridge rail conduit size is 2 inches in diameter. Conduit for the overhead and underdeck lighting is usually 1 inch in diameter. The Office of Bridges and Structures will specify a larger conduit size if they determine it is warranted.

### Single Bridges

The following guidelines should be applied to determine if conduit is warranted through one or both bridge rails of a single bridge:

- If the bridge is part of an interchange, run conduit through both bridge rails. This will provide one conduit for interchange lighting and another conduit for other utilities.
- If the bridge is near an urban area, but not part of an interchange, run conduit through both bridge rails. One of the conduits may be used by a nearby city for street lighting, and the other conduit may be used for other utilities. A bridge with a pedestrian sidewalk would be included in this category.
- For all other bridges, run conduit through one bridge rail for other utilities. Check for existing utility lines on the plan sheet. If utility lines are present, run the conduit in the corresponding bridge rail. If no utility lines are apparent on the plan, the conduit may be placed in either bridge rail. Note the exception to this rule later in this section.

### Dual Bridges

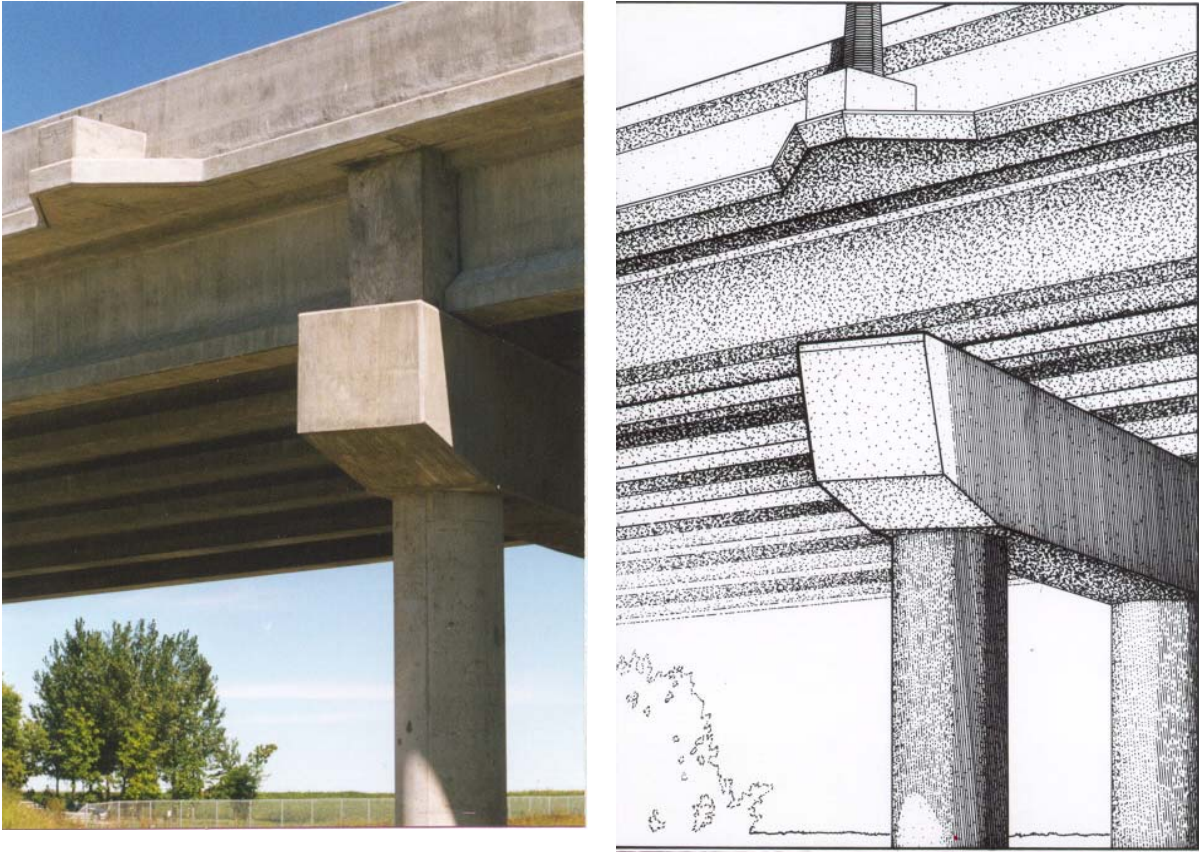
The following guidelines should be applied to determine if conduit is warranted through one or both bridge rails of a dual bridge:

- If the bridges are part of an interchange, run conduit through the outside bridge rails to accommodate lighting cables. If other utilities need to be run across the bridge, an additional conduit may be installed through the outside bridge rails. Since lighting and utilities are seldom located in the median, conduit will not likely be needed in the median side bridge rail.
- If the bridges are near an urban area, but not part of an interchange, run conduit through the outside bridge rail to accommodate lighting cables. If other utilities need to be run through the bridge, another conduit may be installed in the outside bridge rails. A bridge with a pedestrian sidewalk would be included in this category.
- For all other bridges, run conduit through one of the outside bridge rails to accommodate other utilities. Check the plan sheet for existing utility lines. Run conduit on the side of the bridge where utility lines are present. If no utility lines are apparent on the plan, the conduit may be placed in the outside bridge rail on either side.

### Pole Bases

In some cases, the bridge will be part of a continuously-lit roadway, in which case one or more pole bases (blisters) may need to be constructed on the side of the bridge. Pole bases should be located on the bridge structure to provide sufficient lighting levels when lighting is constructed. At the same time, the pole bases should be located on the bridge in such a way as to minimize impact to the aesthetics of the bridge structure. Following the recommendation in the April 15, 1998, *Report of the Bridge Design Aesthetics Team*, this may best be accomplished by placing the pole base over the bridge piers as shown in Figure 2. If the length of the bridge permits lighting the structure sufficiently from the roadway, then light pole bases should not be used on the structure.

Pole bases are warranted near or in urban areas where continuous lighting is existing or planned, or a possibility within 20 to 40 years from the construction of the bridge. After 20 to 40 years, the bridge may likely undergo a rehabilitation that may be extensive enough to include retrofitting pole bases onto the structure. When such an extensive rehabilitation is planned, the need for lighting on the structure should be reconsidered and pole bases should be added as necessary.



**Figure 2**

Pole base located off center of pier and over pier.

To determine how many pole bases are needed, the mounting height (MH) of the luminaire must be known. Normally, MH is assumed to be 40 to 50 feet for bridge-mounted lighting. For short bridges (length  $< 6 \times \text{MH}$ ), only one pole base is needed and it should be placed near the center of the bridge. For longer bridges (length  $> 6 \times \text{MH}$ ), several pole bases may be needed.

- if  $6 \times \text{MH}$  to  $< 12 \times \text{MH}$ , then 2 bases are needed.
- if  $12 \times \text{MH}$  to  $< 18 \times \text{MH}$ , then 3 bases are needed.
- if  $18 \times \text{MH}$  to  $< 24 \times \text{MH}$ , then 4 bases are needed, and so on.

The following example illustrates how multiple poles should be spaced on a bridge that needs two pole bases:

$$\begin{aligned}\frac{S}{2} + \frac{S}{2} + S &= 360 \text{ ft} \\ 2S &= 360 \text{ ft} \\ S &= 180 \text{ ft} \\ \frac{S}{2} &= 90 \text{ ft}\end{aligned}$$

where :

S = distance between pole bases



**Figure 3**

Generally, multiple pole bases should be spaced as shown in the example above.

If a bridge is being reconstructed in an area with existing lighting, the pole bases should be spaced in relation to the existing lighting with full consideration of the aesthetic design. As mentioned before, this may best be accomplished by placing the pole base over the bridge piers.

### **Single Bridges**

If pole bases are warranted on a single bridge, their station location and side of the bridge should be specified on the bridge situation plan. If electrical lines are shown on the plan sheet on one side of the bridge, the pole bases should usually be placed on that side, otherwise either side of the bridge is acceptable.

### **Dual Bridges**

For dual bridges, the same rules apply for determining how many pole bases are needed and how to space them. However, the pole bases should be provided on both bridges. Usually the pole bases are placed on the outside of the bridge and not on the median side.

## Lighting Underneath Bridges

Conduits for underdeck lighting for single or dual bridges are warranted in the following cases:

- Sidewalks or other pedestrian facilities are being constructed under the bridge(s).
- A single bridge spans a roadway or interchange ramp where continuous lighting exists, is planned, or a possibility within 20 to 40 years from the construction of the bridge and the structure is greater than 60 feet wide. The same applies to a dual bridge with the width being the distance between the outside edges of both structures. After 20 to 40 years, the structure(s) may likely undergo a rehabilitation. When a rehabilitation is planned, the need for underdeck lighting on the structure should be reconsidered and the conduit and junction boxes should be added as necessary.

If underdeck lighting is warranted, the location station of the underdeck lighting outlet should be specified on the bridge situation plan.

Conduits and fixture boxes may be added externally to structure as needed; however, these may detract from the aesthetics of the bridge. The use of these should be discussed with the Office of Bridges and Structures for each situation.



**Figure 4**

Underdeck lighting using externally mounted conduits. Conduit and fixture boxes should be cast in concrete when possible to provide a more aesthetic appearance.

## Junction Boxes

Junction boxes are used to connect electrical cable in conduits from outside of the bridge to conduit in the bridge. The following guidelines should be used in determining the location of junction boxes on a bridge:

- If a bridge rail contains a utility conduit, a junction box is needed at the both ends of the bridge rail.
- If pole bases are being constructed on a given side of the bridge, a junction box is needed on both ends of the associated bridge rail.

If underdeck lighting conduit is being constructed on a given side of the bridge, a junction box is needed on both ends of the associated bridge rail.

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